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Severe Depressive Episode with Psychotic Symptoms and Type 2 Diabetes: A 2010–2017 Longitudinal Study

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Background: There have been few studies published on the prevalence of severe depressive episode in people with type 2 diabetes (T2DM) or its role in adherence to dietary recommendations. We examined the Polish National Health Fund (NFZ) database estimates of all medical visits from 2010 to 2017 to determine the trend and the epidemiology of severe depressive episode in T2DM.





Material/Methods: The NFZ database was used. We defined the T2DM group diagnosed with both T2DM and severe depressive episode according to the ICD-10 codes. The annual prevalence of severe depressive episode was estimated according to the T2DM diagnosis status, and the age groups were stratified into 8 groups.

Results: Relative risk for depression (regardless of severity of symptoms) in T2DM is 1.347 [95%CI: 1.342–1.353]. The frequency trend of severe depressive episode with or without psychotic symptoms remains relatively stable. In the case of mild and moderate depressive episode, a downward trend was noted, but they are still the most frequent mood disorders diagnosed. Patients with T2DM aged 20 to 40, for whom the peak of coexistence of these illnesses was noted, are the group particularly vulnerable to depression. Depression also remains on a relatively high but stable level for patients over 60 years of age.

Conclusions: The coexistence of depressive episodes in T2DM is a key challenge for medicine and public health. Measures aimed at early identification of patients with T2DM prone to depression need to be taken. Creating multidisciplinary care teams in diabetes management is also necessary.

MeSH Keywords: **Affective Disorders, Psychotic • Depressive Disorder • Diabetes Mellitus, Type 2 • Longitudinal Studies • Odds Ratio**

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Background

Type 2 diabetes mellitus (T2DM) is a common health problem with serious medical consequences. Globally, the number of people with diabetes mellitus has quadrupled in the past 3 decades, and diabetes mellitus is the 9th leading cause of death. About 1 in 11 adults worldwide now have diabetes mellitus, 90% of whom have T2DM [1]. It is estimated that between 2010 and 2030, there will be a 69% increase in numbers of adults with diabetes in developing countries and a 20% increase in developed countries. T2DM reduces life expectancy by up to 10 years [2]. Diabetes is a growing problem in Poland, and it is estimated that about 3 million of Poles have diabetes, with about 1 million of them is still undiagnosed [3].

One of major illnesses frequently coexisting with diabetes is depression [4–6]. The relationship between T2DM and depression has been investigated by many researchers. Research shows that clinically significant depression is present in 1 of every 4 people with T2DM [7]. A meta-analysis reported 24% increased risk of incident depression in T2DM patients as compared with non-diabetics [8]. Other research suggests that about 20–30% of elderly patients with diabetes suffer from clinical depression, and around 10% of them have major (clinical) depression [4]. Very similar data about prevalence rates of depression in T2DM patients (24–30%) was reported by Siddiqui [9]. People in their 70s with diabetes had a slightly higher prevalence of depression, while those in their 40s with diabetes had a 2-fold higher prevalence of depression relative to persons without diabetes in the respective age groups [10]. In another study, it was observed that the prevalence of major depression, major and minor depression, and symptoms of depression were highest in the 30–39 and 40–49 age groups [11]. The findings from the present study show that younger age is a risk factor for depression in persons with diabetes.

The relationship between depression and diabetes is incompletely understood, but it is clear that depression has an adverse impact on the course of diabetes, and diabetes complications may increase the risk of depression. This association is primarily driven by somatic-affective symptoms of depression [7]. Additionally, coexisting depression in T2DM also increases the risk of development of diabetic complications, such as retinopathy, nephropathy, neuropathy, sexual dysfunction, and macrovascular disease. Depressed patients have a more negative self-appraisal of their diabetes, perceiving more symptoms, more serious consequences, and less control over their diabetes [7,12]. The overall effect is that depression interferes with good glycemic control. Furthermore, poor glycemic control may adversely affect mood and thereby reinforce the relationship between diabetes and depression [12]. Depression also has a negative effect on self-care activity and is associated with poor participation in education programs, poor diet, and poor medication adherence [13].

In the literature, differences between men and women in the frequency of coexistence of diabetes and depression are stressed. For example, cross-sectional studies conducted by Sughra et al. [14] on a group of 110 diabetic patients showed that females experienced more mood disturbances and depression as compared to males, but the difference was not statistically significant. It needs to be noted, however, that there were many more women in the analyzed group, and they accounted for 81.8% all respondents. In another study, involving 628 outpatients with T2DM, it was shown that the proportion of women with pathological levels of depression (34.3%) was significantly higher than in men (15.2%). A linear regression analysis showed poorer metabolic control in women with depressive symptoms, but no such association was observed in men [12]. Interesting results were noted in the First National Health and Nutrition Examination Survey, which enrolled 3233 participants aged 25–74 years from 1971 to 1974, reporting that depressive symptoms were related to increased diabetes risk among women but not among men. In the First National Health and Nutrition Examination Survey, the risk ratio comparing high versus low depressive symptoms for men and women were 0.69 (0.43–1.100) and 2.11 (1.06–4.19) (P-value for interaction=.007). In the Detroit Neighbourhood Health Study, the risk ratio for prevalent diabetes comparing those with high versus low depression were 1.30 (.46–3.68) for men and 2.32 (1.10–4.89) for women (P-value for interaction=.16) [15].

Depression occurs in different intensities and, depending on the severity of symptoms, it may negatively influence the treatment process of patients with diabetes [16]. Special attention should be focused on severe depressive episode, because this type of depression is characterized by severe intensity of negative symptoms. Common negative symptoms were inability to enjoy recreational interests and activities, feelings of anhedonia, and physical anergia [17]. Additionally, severe depressive episode may co-occur with psychotic symptoms, the coexistence of which may dramatically impair therapy. For example, such a patient may refuse medical therapy. This non-adherence in medical and nutrition care increase the symptoms of diabetes. In the literature, there are few studies that analyzed how often psychotic symptoms co-occur with type 2 diabetes patients with depressive episode. Much of the research on depression and diabetes has been cross-sectional. For this reason, longitudinal studies could help clarify the causal nature of the relationship between these 2 disorders. There is a shortage of complex analyses of epidemiological data on the prevalence of depression in patients with T2DM in various age groups, including the severity of symptoms in depression in the context of gender. Obtaining such detailed data will allow the development of more effective forms of medical care for these patients, especially those with psychotic symptoms. In the literature, there is also a lack of research assessing the trend of coexistence of T2DM and depression with varying intensity,

especially severe depressive episode with psychotic symptoms, not only in women, but also men. In this regard, the aim of the present study was to assess the frequency of coexistence of T2DM and depression – mild, moderate, and severe depressive episode, with or without psychotic symptoms – in the context of age and gender of patients. A secondary aim was to determine which age groups of patients with T2DM most frequently have coexisting depression.

Material and Methods

Source of database

The National Health Information database maintained by the Polish National Health Fund (NFZ) was used. Retrospective data from January 2010 to December 2017 were collected for T2DM patients older than 10 years. The decision to include patients with T2DM aged 10 years and older in the study was made based on diagnoses in the NFZ database. Patients with T2DM aged 10–18 years are included in the database. Before, this type of diabetes was recognized as a disease of adults only [18]. However, the incidence of type 2 diabetes in youth has increased dramatically over the past 20 years. In the United States, estimates are as high as 5000 new cases per year. Prevalence increases with age, tripling from age 10–14 years to age 15–18 years [18].

The NFZ collects medical data from state medical centers and private medical centers that signed a contract with NFZ under which medical services are financed from public funds. In this study, patients from state medical centers and private medical facilities were analyzed together, but only those who used public funds. Collecting medical data by NFZ is regulated by the Regulation of the Minister of Health of 20 June 2008 (last amendment of 01.07.2017) [19], and the database of medical services run by NFZ registers all patients who receive medical services financed from public funds [19].

Diabetes is a chronic illness, the financing of which is financed from public funds. Patients with diabetes who receive publicly-funded state medical care can obtain medical care for free in Poland, as well as partial reimbursement of medications and specialized medical examinations. In Poland, most patients with diabetes receive state medical care rather than private care [20].

The NFZ database includes specific information on the demographic characteristics (gender and age), consultation statements, and diagnosis by the ICD-10 [17]. These data are widely accepted to be representative of the entire Polish population, which increases its utility as a source of data for population-based nationwide studies. Visit sampling and data collection were recorded on patient record forms by hospital staff or by

field representatives from the NFZ. Data collection methods do not indicate that data recording by hospital staff was done prospectively. Therefore, this study should be considered (conservatively) as a retrospective chart review. Data processing and coding were performed by NFZ.

The criteria for patient inclusion in the study involved: 1) T2DM diagnosed by a diabetologist in line with ICD-10 [17] and 2) depressive episode (F32) diagnosed by a psychiatrist in line with ICD-10 [17] and the following diagnoses of depression were taken into consideration: mild depressive episode (F32.0), moderate depressive episode (F32.1), severe depressive episode without psychotic symptoms (F32.2), and severe depressive episode with psychotic symptoms (F32.3); and 3) obtaining state medical care in the years 2010–2017. Adequate consents for data use were obtained from NFZ. On the basis of the criteria for inclusion to the study from the whole database of patients with diabetes, only patients fulfilling the above criteria were included.

Definition of diabetes mellitus and depressive episode

All participants were diagnosed with T2DM according to ICD-10 codes [17] at baseline, and patients over the age of 10 years with a diagnostic code (ICD-10) of T2DM (E11) more than once in a given year from January 2010 to December 2017 were included. They all made at least 1 visit to outpatient care or inpatient care to diagnose T2DM. We defined the T2DM group diagnosed with both T2DM and depressive episode (F32.0, F32.1, F32.2, F32.3) according to the ICD-10 codes [17] at baseline.

Ethical considerations

Our study is a retrospective data analysis from the period 2010–17 and our data came from a public database. For this reason, we do not require approval from an independent ethics committee (IEC). The authors sought advice from the Bioethics Committee of Medical University of Warsaw to conduct the present study. As the “commission does not issue opinions on the survey, retrospective and other non-invasive scientific studies”, approval was not required. Data owners have given permission to use them.

Statistical analysis

The demographic characteristics for the participants were analyzed through descriptive statistics. The annual prevalence of depressive episode was estimated according to the T2DM diagnosis status, and the age groups were stratified into 8 groups (11–20, 21–30, 31–40, 41–50, 51–60, 61–70, 71–80, and ≥81).

For the incidence of depressive episode (F32.1–F32.3) [17] in patients with T2DM in the years 2010–17, the relative risk (RR)

Table 1. The number of patients with diagnosed depressive episodes and T2DM in a group of women and men in the years 2010–17.

Year	Female		Male		Total
	N	%	N	%	N
2010	25 183	74.5	8 621	25.5	33 804
2011	24 429	73.8	8 682	26.2	33 111
2012	23 984	73.3	8 728	26.7	32 712
2013	21 834	73.0	8 086	27.0	29 920
2014	20 008	73.0	7 388	27.0	27 396
2015	18 208	72.4	6 950	27.6	25 158
2016	16 785	71.9	6 568	28.1	23 353
2017	15 604	72.1	6 048	27.9	21 652

with 95% confidence interval (95%CI) was calculated [21]. For this purpose, patient data on number of patients receiving publicly-funded healthcare in Poland, the number of patients with diagnosed T2DM, and the number of patients with co-existent depressive episode (F32.1–F32.3) and T2DM were all considered separately.

Results

The frequency of coexistence of T2DM and depressive episode among women and men

To evaluate the prevalence of depressive episode in T2DM, the following diagnoses of depression were added up: mild depressive episode (F32.0), moderate depressive episode (F32.1), severe depressive episode without psychotic symptoms (F32.2), and severe depressive episode with psychotic symptoms (F32.3). Table 1 shows that the analyzed depressive episodes were much more frequent in women than in men (frequency ratio 3: 1).

Relative risk of the occurrence of depressive episodes in T2DM

Based on data from the NFZ database, the RR for the occurrence of depression in patients with T2DM for the years 2010–17 was calculated. The RR index for the diseases analyzed was $RR=1.347$ [95%CI: 1.342–1.353].

The trend of coexistence of T2DM and depressive episode depending on the severity of depressive symptoms

Our results show that the prevalence of severe depressive episode without psychotic symptoms (F32.2) and severe depressive episode with psychotic symptoms (F32.3) remained

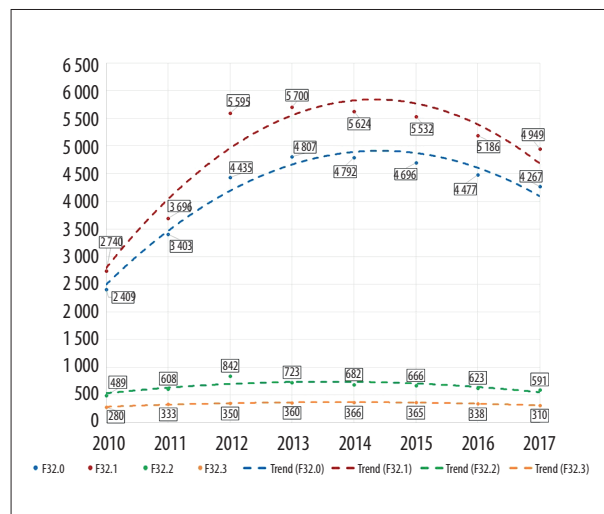


Figure 1. The number of F32 cases broken down by years 2010–17 together with the trend line (polynomial function of degree 2).

relatively stable. There were 650 patients with T2DM with severe depressive episode without psychotic symptoms, and there were 330 T2DM patients with severe depressive episode and psychotic symptoms. This shows that almost every year approximately 1000 diabetic patients have a severe depressive episode with or without psychotic symptoms. In the case of mild depressive episode (F32.0) and moderate depressive episode (F32.1), a downward trend was recorded. It should be noted, however, that F32.0 and F32.1 are still the most frequently diagnosed mood disorders (Figure 1).

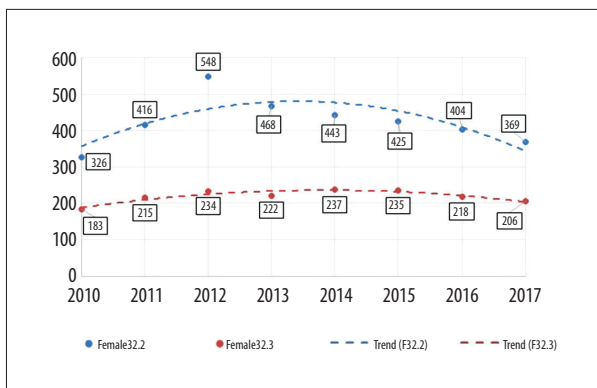


Figure 2. The number of women with T2DM and severe depressive episode without psychotic symptoms (F32.2) and severe depressive episode with psychotic symptoms (F32.3) broken down by years 2010–17 together with the trend line (polynomial function of degree 2).

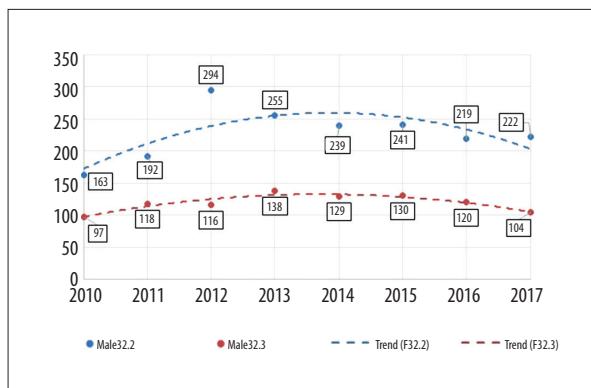


Figure 3. The number of men with T2DM and severe depressive episode without psychotic symptoms (F32.2) and severe depressive episode with psychotic symptoms (F32.3) broken down by years 2010–17 together with the trend line (polynomial function of degree 2).

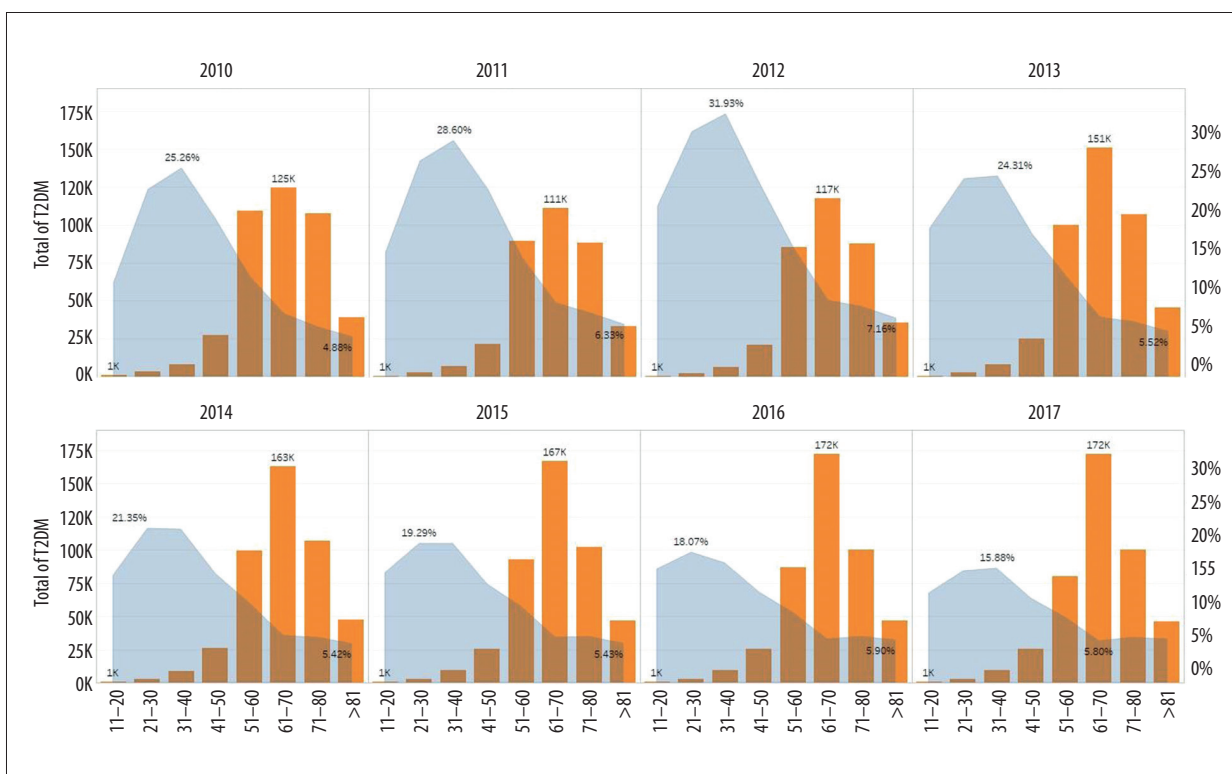


Figure 4. The coexistence of T2DM and various types of depressive episode in age groups in the years 2010–17.

The frequency of coexistence of T2DM and severe depressive episode with or without psychotic symptoms among men and women

In women, there was a slight decrease in the prevalence of severe depressive episode without psychotic symptoms (F32.2). However, in patients with severe depressive episode with psychotic symptoms (F32.3) there was a relatively stable trend of

prevalence of the disorder in women with T2DM (Figure 2). The trend of prevalence of severe depressive episode without psychotic symptoms (F32.2) and severe depressive episode with psychotic symptoms (F32.3) among men with T2DM was similar to the observations made in the case of women (Figure 3).

Coexistence of T2DM and different types of depressive episode in particular age groups

The analysis of prevalence of different types of depressive episode among patients with T2DM in various age groups in the years 2010–17 demonstrated that patients ages 20–40 were most likely to have coexistence of these 2 disorders. Additionally, the prevalence of depressive episode decreases slowly after the age of 40 until the age of 60, and remains relatively stable in subsequent years. These observations were recorded in each of the analyzed years (Figure 4).

Discussion

We found that the RR of depression occurring in patients with T2DM for the years 2010–17 was 1.347 [95%CI: 1.342–1.353]. The results obtained approximate the results of other researchers. Pan et al. [22] studied a group of 65 381 women aged 50–75 years from 1996 to 2006. The RR for individuals with depressed mood was 1.17 (95%CI: 1.05–1.30) after adjustment for various covariates. It should be noted that the aggravation of depressive symptoms was assessed in this study based on Mental Health Index (MHI-5) score. Vancampfort et al. [16], on the other hand, performed a literature review on the prevalence and predictors of T2DM in patients with major depressive disorder (MDD). A comparative meta-analysis revealed people with MDD (N=154,366) had a higher risk of T2DM versus general controls (N=2 098 063; RR=1.49; 95%CI: 1.29–1.72; P<.001). The RR focusing on age- and gender-matched general population controls (N=103,555) was 1.36 (95%CI: 1.28–1.44; P<.001).

It is worth noting, however, that the data in the literature on the prevalence of depression are varied [4–6]. Fiore et al. [4] found that about 20–30% of patients with diabetes suffer from clinically relevant depressive disorders, 10% of which are affected by major depressive disorder. However, a meta-analysis by Anderson et al. [23] suggests that over 11% of patients with diabetes meet the criteria for the diagnosis of depression, while 31% of these have particular depression symptoms. It is believed that lifetime rates of depression in patients with T2DM are between 24% and 29%, and the point-prevalence is 10–15% [24]. Other studies found that depression is twice as common in patients with T2DM compared with other patients in primary care settings, affecting 11–15% of this group. Moreover, the prevalence of depression may be even higher in patients with diabetes who have multiple complications [25]. Golden et al. [5] screened a clinical sample of 702 adults with T2DM for depressive symptoms using the Patient Health Questionnaire-2 and performed a structured diagnostic psychiatric interview. The crude prevalence of current, past, and current or past minor depressive

disorder (MinD) was 4.3% (95% CI: 0.9–9.2%), 9.6% (95% CI: 3.9–15.9%), and 13.9% (95% CI: 7.7–21.2%), respectively. The crude prevalence of current, past, and current or past MDD was slightly higher, at 5.0% (95% CI: 1.9–9.4%), 12.0% (95% CI: 6.1–19.5%), and 17.0% (95% CI: 10.1–24.8%), respectively.

Difficulties with determining the actual number of patients with T2DM affected by depressive episode presented in the literature may stem from heterogeneous research methodologies. For example, in some studies the prevalence of depression in all kinds of diabetes was assessed together. It needs to be remembered, though, that both T2DM and T1DM have totally different specificity. This may affect the differences in the prevalence of depression in patients with the 2 different types of diabetes mellitus (DM). For example, a systematic review by Roy and Lloyd [26] indicated that the prevalence rate of depression is more than 3 times higher in people with type 1 diabetes (12%, range 5.8–43.3% vs. 3.2%, range 2.7–11.4%) and nearly twice as high in people with T2DM (19.1%, range 6.5–33% vs. 10.7%, range 3.8–19.4%) compared to those without.

The other important factor influencing data on the prevalence of depression in diabetes is the use of different criteria for a depressive episode. For example, in some studies, only scales for the evaluation of aggravation of depressive symptoms were used [5], while in others, ICD-9, ICD-10, DSM-IV, and DSM-5 classifications were employed. Diagnosis of depression by GP doctors can be very difficult because it requires specialist knowledge and advanced social skills. In addition, many patients with depression do not seek medical help. These factors can give unrealistic data about the prevalence of depression in diabetic patients [16].

The epidemiological data show that in the years 2010–17 in Poland, doctors diagnosing depressive disorders in patients with T2DM more often indicated mild depressive episode (F32.0) and moderate depressive episode (F32.1). Despite a recorded downward trend, F32.0 and F32.1 are still the most frequently diagnosed depressive episodes. Additionally, the present study showed that the prevalence of severe depressive episode without psychotic symptoms (F32.2) and severe depressive episode with psychotic symptoms (F32.3) remains relatively stable, irrespective of gender. A detailed analysis of medical diagnoses demonstrated that in the years 2010–17 approximately 1000 patients with diabetes suffered from severe depressive episode. Severe depressive episode is characterized by a very high aggravation of negative symptoms such as persistent low mood, profound sadness, or a sense of despair [17]. A patient suffering from severe depression may withdraw from medical treatment altogether, which will influence their well-being and aggravation of symptoms not only of DM, but also of depression, with particularly poor prognoses for those with psychotic symptoms.

Our 8-year observation indicates that each year, on average, doctors had about 330 patients with DM and coexisting severe depressive episode with psychotic symptoms. It therefore seems reasonable to provide education for patients with T2DM for depression prevention. Such education should also be aimed at doctors [27]. For doctors, special attention must be focused on improving communication skills, especially establishing contact with depressive patients and working with resistance. Skilled interaction with depressive patients may help reduce their passivity and withdrawal [28]. Frequently, such a patient's withdrawal may cause a doctor to feel helpless and to conclude that the patient is "upset with the world". Additionally, physicians should be aware of the co-morbid psychiatric disorders likely to be associated with diabetes. Consequently, these patients should be regularly screened for common psychiatric disorders [27]. It should be noted that, in Poland, many patients with depressive episode use primary care and have medical visit with GP doctors, not psychiatrists. Therefore, GP doctors often have to diagnose depression without psychiatric preparation. Depression is difficult to diagnose because many other conditions have similar symptoms, such as a bad mood, which is treated as a normal reaction to a physical illness. For this reason, doctors can find it difficult to make a correct diagnose of depression [29].

Doctors may also have troubles determining the degree of aggravation of depressive symptoms. In their clinical practice, doctors choose the relevant diagnosis of depressive disorders (relevant ICD code [17]) based on the information about whether the current depressive episode is the first one or is recurrent, as well as on the current specification of intensity and presence of psychotic symptoms and the recurrence status [17]. One of the problems may be difficulty in determining borders between degrees of aggravation of depressive symptoms, which are rarely sharp. An important factor that may also be important in the context of diagnostic difficulty with depression in patients with type 2 diabetes is limited access to psychiatric healthcare financed from public funds. The bulletin 'Health and Health Impact Assessment in 2016' [30] shows that psychiatry is among the medical fields with a shortage of physicians and there are concerns that this shortage will be even greater in the future. In addition, in the course of DM, patients may be distressed about their illness, which is a state similar to depression, but not severe enough to be diagnosed as depression [30, 31]. Additionally, it is stressed in the literature that depressive disorders are common in a GP's practice, but depression is often overlooked during medical consultations. It may also be connected with the fact that there is shortage of adequate clinical guidelines for treatment of patient suffering from T2DM with coexisting depression [31]. It may also stem from the professional reality of a GP, who has a limited medical consultation time, during which a doctor runs his diagnostics and basic therapy for various chronic illnesses [31].

However, depression in patients with diabetes is often inadequately treated within primary care. For this reason, physicians should be sensitive to the need to assess for possible depression and its risk factors in diabetic patients [25].

The presented epidemiological data pertaining to the prevalence of coexisting depression in T2DM over the period of 8 years indicate important gender-based differences. Based on the observations made, it can be stated that depression in T2DM occurs about 3 times more frequently in women than in men. It needs to be stressed that the presented results comply with general data pertaining to the prevalence of depression in the general population in terms of gender [12,14,15]. Estimates prove that depression affects about 15% of women and 10% of men; thus, the risk depression in women is double that in men [32]. In the literature there are a few hypotheses explaining these gender differences. The majority relate to social and cultural aspects (e.g., social norms), psychological factors (e.g., the phenomenon of learned helplessness, negative self-image, loneliness, cognitive distortions) or biological factors (e.g., hormonal changes on a monthly basis) [32].

Many studies do not report gender differences in the outcome of psychological treatment, but some research has identified specific gender differences in various aspects of therapy. These differences can be summarized as 'men seek a quick solution, whereas women want to talk about their feelings'. Men and women differ in important ways with regards to their preferences for therapy, coping styles, and help-seeking behaviors. Age, ethnicity, income, marital status, educational status, and occupational status, as well as previous experience of therapy, were also found to predict preferences. Because male help-seeking seems to be hampered by barriers at both the personal level (i.e., men struggle asking for help) and systematic level (i.e., lack of male-friendly services), action is needed to address the issue of improving use of mental health services by men [33].

Analysis of the prevalence of various types of depressive episodes (altogether) among patients with T2DM in various age groups in the years 2010–17 has proved that patients age 20–40 are particularly prone to the coexistence of these 2 illnesses. Taking into account research results in the field of developmental psychology and Erikson's psychosocial developmental theory, it may be noticed that the period from age 20 to age 40 involves both early and late adulthood stages. In this period, people are focused on forming stable bonds with others, and it is also a period of stabilization [34]. A chronic illness, such as diabetes, may negatively influence self-image and disrupt the perception of one's own body and the sense of self-esteem. Such a distorted image negatively influences the creation of firm relationships [35]. On the other hand, research in the field of health psychology show that adequate level of social support (e.g., the support of close relatives or

being in a relationship) is conducive to adherence to medical recommendations [36]; thus, it seems reasonable to focus on early prevention and detection of depression in patients with T2DM. Special attention is needed for patients aged 20–40, as the greatest coexistence of depression and T2DM was noted in this age range.

Patients with T2DM age 60 and above are another important age group. Our 8-year observation indicates that the prevalence of depression in patients over 60 of age is moderately stable. Reduced mood may also boost multiple morbidities, which occurs in patients over age 60, which may negatively influence adherence to medical recommendations. A proportion of the illnesses may be connected with the occurrence of depressive mood [37], for example, cardiological illnesses [38]. It is also worth remembering that epidemiological data indicate that the number of elderly people is growing in the general population [39]. Taking into account that T2DM also occurs in older people, and depression remains relatively stable, this may be an important subject for public health. Research shows that people over age 60 have specific expectations of their GP, which need to be taken into account during their visits. The most important patient expectations concern information about disease and treatment, quality of life, health promotion, patient-physician rapport, and emotional support. These expectations may be important in the context of diabetes treatment because they can increase patient involvement in the treatment process; therefore, physician communication skills could be of fundamental importance [40]. It is especially important in the context of prevention and early identification of patients with the beginnings of depressive disorders.

Caring for patients with diabetes is a challenge that requires cooperation across healthcare specialties. This study suggests the need to create multidisciplinary care teams in diabetes management, especially in the case of the coexistence of depressive episodes in T2DM. To successfully manage diabetes, patients with coexistence of depressive episodes may need more contact with the care team than a single primary care physician can provide. Using a care team-based approach to diabetes management is a cost-effective way to provide patient-centered diabetes care.

Limitations

The present study is not devoid of limitations. One of them is taking into account only patients receiving state medical care, and another is the relatively small number of patients with depression. It is worth noting that access to state psychiatric consultations is limited, because there is shortage of psychiatrists [29]. In this regard, many patients with depression may obtain private psychiatric consultations, so our data may be incomplete. Another important limitation are the low rates

of detection of psychiatric disorders among those suffering from diabetes. Up to 45% of the cases of mental disorder and severe psychological distress go undetected among patients being treated for diabetes [41]. Another important limitation of the study is taking into account only patients who actively participate in the treatment and benefit from medical visits. Our analyses did not take into account also the undiagnosed patients, such as those who are unaware of their depression or who deny it. The number and type of psychotropic drugs used were also not analyzed in this study. There is evidence suggesting that the psychotropic drug use have some effects on the glucose–insulin system [42], so this may be an important limitation of the present study. Another important limitation is the problem with the public's social stereotypes of a psychiatrist in Poland, and negative social attitudes toward psychiatrists often affects the patient's attitude toward medical help.

Despite the above-mentioned limitations of our 8-year study, which encompasses a representative Poland-wide sample, our results provide new information on the prevalence of severe depressive episode with or without psychotic symptoms, and therefore depression with severe and unfavorable prognosis. Our results, similar to the results of other studies, stress that the prevalence of depression in T2DM is a serious problem, and actions need to be taken to detect and prevent the development of depression. It is worth remembering that co-occurring psychiatric disorders in patients with diabetes are associated with impaired quality of life, increased cost of care, poor treatment adherence, poor glycemia control (as evidenced by elevated HbA1c levels), increased emergency room visits due to diabetic ketoacidosis, higher frequency of hospitalization, and higher rate of absenteeism. Additionally, there is an increase in cost of medical care [27].

Conclusions

Depressive disorders in patients with T2DM are an important challenge to medicine and public health. Caring for patients with diabetes is a challenge that requires cooperation across health care specialties. Although the discussed coexistence of the 2 disorders is more common in women, many men also have both T2DM and depressive disorders. Therefore, actions need to be taken to identify patients with T2DM who may experience depression. Special attention needs to be focused on patients aged 20–40, for whom the peak of coexistence of T2DM and depressive episodes was noted, as well as patients over 60 in who depression remains relatively stable, but whose age group accounts for an ever-growing proportion of the population. Action is also needed to improve physician communication skills, especially skills involved in performing medical investigations and providing therapy for patients with depression.

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